Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An electromagnetic actuator, comprising:

first and second magnetic members;

a first electromagnetic coil;

the first magnetic member being moveable relative to the second magnetic member between first and second positions, and being electromagnetically attracted to ~~the first~~ an actuated position by electrical excitation of the first electromagnetic ~~coil;~~ coil, the actuated position being one of the first and second positions;

a first preloaded spring configured to apply a first spring force to the first magnetic member ~~biasing the first magnetic member toward the second position~~ only when the first magnetic member is in or between the first position and some fraction of its travel from the first position to the second ~~position,~~ position; and

a second preloaded spring configured to apply a second spring force to the first magnetic member throughout its travel from the first position to the second position, the second preloaded spring cooperating with the first preloaded spring to provide a step change in total spring force applied to the first magnetic member near the actuated position. ~~to force the first magnetic member to one of the first and second positions when the first magnetic member is not magnetically attracted to the first position.~~

2. (Canceled)

3. (Currently Amended) The actuator of claim 1, ~~claim 2,~~ wherein the actuator requires a holding electrical current in the first electromagnetic coil to maintain the first magnetic member in the actuated ~~first~~ position.

4. (Currently Amended) The actuator of claim 1, ~~claim 2,~~ wherein the first magnetic member will magnetically latch in the actuated ~~first~~ position by residual magnetism, without use of a holding electrical current.

5. (Currently Amended) The actuator of claim 1, ~~claim 2,~~ wherein the actuator has first and second ends, and wherein the first electromagnetic coil and the first and second preloaded springs are adjacent the first end of the actuator.

6. (Currently Amended) The actuator of claim 1, ~~claim 2,~~ wherein the actuator has first and second ends, and wherein the first electromagnetic coil is adjacent the first end of the actuator and the first and second preloaded springs are adjacent the second end of the actuator.

7. (Currently Amended) The actuator of claim 1, ~~claim 2,~~ wherein the first and second preloaded springs are adjacent opposite ends of the actuator.

8. (Previously Presented) The actuator of claim 1, further comprised of a second electromagnetic coil, the first magnetic member being electromagnetically attracted to the second position by electrical excitation of the second electromagnetic coil, the second preloaded spring being configured to apply the second spring force to the first magnetic member biasing the first magnetic member toward the first position when the first magnetic member is in or anywhere between the first and second positions.

9. (Canceled)

10. (Previously Presented) The actuator of claim 8, wherein the fraction is less than approximately one half.

11. (Previously Presented) The actuator of claim 8, wherein the fraction is in the range of approximately one fifth to approximately one fourth.

12. (Currently Amended) The actuator of claim 1, wherein the actuator has a zero nonmagnetic gap when the first magnetic member is in the actuated ~~first~~ position.

13. (Original) The actuator or claim 12, wherein the first magnetic member is a spool of a spool-type fluid control valve.

14. (Withdrawn) A spool-type fluid control valve, comprising:

a magnetic spool and a magnetic spool valve housing, the spool being moveable relative to the housing between first and second positions;

a first electromagnetic coil disposed in the housing and operable to electromagnetically attract the spool to the first position upon electrical excitation of the first electromagnetic coil;

a first preloaded spring configured to apply a first spring force to the spool biasing the spool towards the second position only when the spool is at any of i) the first position, ii) anywhere between the first position and some fraction, less than one, of its travel from the first position to the second position, and iii) the fraction of its travel from the first position to the second position.

15. (Withdrawn) The spool-type fluid control valve of claim 14, further comprised of a second preloaded spring configured to apply a second spring force to the spool biasing the spool towards the second position when the spool is at any of i) the first position, ii) the second position, and iii) anywhere between the first and second positions.

16. (Withdrawn) The spool-type fluid control valve of claim 15, wherein the spool valve requires a holding electrical current in the first electromagnetic coil to maintain the spool in the first position in opposition to the first and second spring forces of the first and second preloaded springs.

17. (Withdrawn) The spool-type fluid control valve of claim 15, wherein the spool will magnetically latch in the first position by residual magnetism, without continuous use of a holding electrical current in the first electromagnetic coil, in opposition to the first and second spring forces of the first and second preloaded springs.

18. (Withdrawn) The spool-type fluid control valve of claim 15, wherein the spool has first and second ends, and wherein the first electromagnetic coil and the first and second preloaded springs are located adjacent the first end of the spool.

19. (Withdrawn) The spool-type fluid control valve of claim 15, wherein the spool has first and second ends, and wherein the first electromagnetic coil is located adjacent the first end of the spool and the first and second preloaded springs are located adjacent the second end of the spool.

20. (Withdrawn) The spool-type fluid control valve of claim 15, wherein the spool has first and second ends, and wherein the first and second preloaded springs are located adjacent opposite ends of the spool.

21. (Withdrawn) The spool-type fluid control valve of claim 14, further comprised of a second electromagnetic coil, the spool being electromagnetically attracted to the second position by electrical excitation of the second electromagnetic coil.

22. (Withdrawn) The spool-type fluid control valve of claim 21, further comprised of a second preloaded spring configured to apply a second spring force to the spool biasing the spool towards the second position when the spool is at any of i) the first position, ii) the second position, and iii) anywhere between the first and second positions.

23. (Withdrawn) The spool-type fluid control valve of claim 22, wherein the fraction is less than approximately one half.

24. (Withdrawn) The spool-type fluid control valve of claim 22, wherein the fraction is in the range of approximately one fifth to approximately one fourth.

25. (Withdrawn) The spool-type fluid control valve of claim 14, wherein the spool has a zero nonmagnetic gap relative to the housing when the spool is in the first position.

26. (Currently Amended) A method of operating an electromagnetic actuator, comprising:

providing first and second magnetic members and a first electromagnetic coil, the first magnetic member being moveable relative to the second magnetic member between first and second positions;

electromagnetically attracting the first magnetic member to ~~the first~~ an actuated position by electrical excitation of the first electromagnetic ~~coil;~~ coil, the actuated position being one of the first and second positions;

compressing a first preloaded spring only as the first magnetic member moves from a position, spaced from the first and second positions, to one of the first position and the second position; ~~position,~~

providing a second spring force with a second preloaded spring to the first magnetic member ~~being aided in its motion~~ as a spring return throughout its travel from the first position to the second position, the second preloaded spring cooperating with the first preloaded spring to provide a step change in total spring force provided as the first magnetic member approaches the actuated position. ~~position by a second preloaded spring;~~

~~storing energy in the first preloaded spring as the spool compresses the first preloaded spring; and,~~

~~returning the first magnetic member to the second position against the spring force of the second preloaded spring by electrical excitation of a second electromagnetic coil and returning the energy stored in the preloaded spring to the first magnetic member as the first magnetic member moves from the first position part way toward the second position.~~

27. (Canceled)

28. (Original) The method of claim 26, further comprising returning the first magnetic member to the second position by a return spring.

29. (Original) The method of claim 28, further comprised of preloading the return spring.

30. (Currently Amended) The method of claim 26, further comprised of maintaining the first magnetic member in the actuated ~~first~~ position using a holding electrical current in the first electromagnetic coil.

31. (Previously Presented) The method of claim 26, wherein the position spaced from the first and second positions is closer to the second position than to the first position.

32. (Previously Presented) The method of claim 31, wherein the position spaced from the first and second positions is in the range of approximately one fifth to approximately one fourth of the way from the second position to the first position.

33. (Withdrawn) A method of operating a spool-type fluid control valve, comprising:

providing a magnetic spool, a magnetic spool valve housing and a first electromagnetic coil, the spool being moveable relative to the housing between first and second positions;

electromagnetically attracting the spool to the first position by electrical excitation of the first electromagnetic coil;

compressing a preloaded spring only as the spool moves from an intermediate position, spaced from the first and second positions, to the first position;

storing energy in the preloaded spring as the spool compresses the preloaded spring;

terminating electrical excitation of the first electromagnetic coil; and,

returning the energy stored in the preloaded spring to the spool as the spool moves from the first position towards the second position.

34. (Withdrawn) The method of claim 33, further comprising returning the spool to the second position by electrical excitation of a second electromagnetic coil.

35. (Withdrawn) The method of claim 33, further comprising returning the first magnetic member from the first position all the way to the second position by a return spring.

36. (Withdrawn) The method of claim 35, further comprised of preloading the return spring.

37. (Withdrawn) The method of claim 33, further comprised of maintaining the spool in the first position by continuously using a holding electrical current in the first electromagnetic coil.

38. (Withdrawn) The method of claim 33, wherein the intermediate position is closer to the first position than to the second position.

39. (Withdrawn) The method of claim 38, wherein the intermediate position is in the range of approximately one fifth to approximately one fourth of the way from the first position to the second position.

40. (Withdrawn) The method of claim 33, further comprising providing i) an instantaneous step increase in effective spring force, biasing the spool towards the second position, when the spool reaches the intermediate position from the second position and ii) an instantaneous step decrease in effective spring force, biasing the spool towards the second position, when the spool reaches the intermediate position from the first position.

41. (Previously Presented) The actuator of claim 12 wherein the actuator has a zero nonmagnetic gap when the first magnetic member is in the second position.